

APPENDIX I

**SUPPORTING INFORMATION
FOR BIOLOGICAL RESOURCES**

BIOLOGICAL RESOURCES

SENSITIVE SPECIES DESCRIPTIONS

Amphibians

Flatwoods Salamander (*Ambystoma cingulatum*)

The flatwoods salamander, listed as federally threatened, is a small mole salamander about 13 centimeters (cm) (approximately 5 inches) in length when fully mature (Federal Register, 1999). Habitat for the flatwoods salamander consists mainly of open, mesic (moderate moisture) woodland of longleaf/slash pine flatwoods maintained by frequent fires. An open canopy is needed for the grasses and sedges to flourish and must be maintained by periodic burning. The ground cover of this habitat supports a rich herbivorous invertebrate community that serves as a food source for the flatwoods salamander.

Adult flatwoods salamanders breed during the rainy season from October to December (Palis, 1997). Their breeding sites are isolated flatwoods depressions that dry completely on a cyclic basis and are generally shallow and relatively small.

The isolated nature of flatwoods salamander populations makes them vulnerable to extirpation. The species must maintain moist skin for respiration and osmoregulation (to control the amounts of water and salts in their bodies). Consequently, since they may disperse long distances to upland sites where they live as adults, desiccation (drying out) can be a limiting factor in their movements. As a result, it is important that areas connecting their wetland and terrestrial habitats are protected in order to provide cover and appropriate moisture regimes during their migration.

Dusky Gopher Frog (*Rana capito sevosa*)

Eglin AFB supports the largest known concentration of reproductive sites of the dusky gopher frog subspecies anywhere within its range. This species utilizes gopher tortoise burrows for cover but will also use old field mouse burrows, hollow stumps, and other holes. They have been found in Sandhills, Sand Pine, and Open Grassland/Shrubland ecological associations up to two kilometers from breeding ponds. For breeding, the species requires seasonally flooded grassy ponds, depression marshes, or upland sandhills lakes that lack fish populations (U.S. Air Force, 1995).

Florida Bog Frog (*Rana okaloosae*)

The Florida bog frog (*Rana okaloosae*), a small yellow-green frog, was first discovered in 1982 and is listed by the state of Florida as a species of special concern. The entire global distribution of this species lies within Walton, Okaloosa, and Santa Rosa counties, with the only known sites found on Eglin AFB and three locations to the north of the base. The species' restricted distribution may be due to characteristics of the area's streams and soil. All known locations are small tributary streams to the Yellow, Shoal, or East Bay Rivers on Eglin AFB or International

Paper's lands. The Florida bog frog utilizes clear, shallow, acid seeps and shallow, boggy overflows of larger seepage streams. It is often associated with sphagnum moss. Habitat for this species is maintained by fire, which controls hardwood encroachment, increases herbaceous species, and maintains soil moisture by reducing hardwood evapotranspiration. This frog relies on the natural, constant hydrological conditions in streams where larvae develop. Breeding takes place from April until August and tadpoles transform the following spring and summer.

Fish

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

The USFWS and NMFS designated the Gulf sturgeon (as threatened under the ESA; listing became official on September 30, 1991). The Gulf sturgeon occurs predominately in the northeastern Gulf of Mexico, feeding in offshore areas and inland bays during the winter months and moving into freshwater rivers, such as the Yellow River and the Choctawhatchee River to spawn during the spring and summer. Little is known about the offshore distance the Gulf sturgeon travels, but analyses of stomach contents suggest that feeding occurs as far as 20 miles offshore (Page and Burr, 1991; U.S. Coast Guard, 1996).

The final rule for Gulf sturgeon critical habitat was published in the Federal Register on March 19, 2003. "Critical habitat" is defined by the ESA as specific areas within or outside the geographical area occupied by the species that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. As pertains to proposed action, critical habitat for Gulf sturgeon feeding and migration includes nearshore areas in the Gulf of Mexico up to 1 nm offshore from Escambia, Santa Rosa, Okaloosa, Walton, Bay, and Gulf counties.

Reptiles

American Alligator (*Alligator mississippiensis*)

The American alligator is federally listed as threatened due to similarity of appearance to the endangered American crocodile (*Crocodylus acutus*). The alligator is listed as a species of concern in the state of Florida. The American alligator frequents permanent bodies of fresh water, to include lakes, rivers, swamps, and marshes. Inactive during winter months, the alligator nests in late spring, with hatchlings emerging in summer. Adults can grow from 6-15 feet in length, with hatchlings averaging about nine inches. Major threats to the species include wetland degradation and destruction (FNAI, 2001a).

Eastern Indigo Snake (*Drymarchon corais couperi*)

The eastern indigo snake was granted protection by the state of Florida in 1971 and was federally listed as threatened in 1978 (Federal Register Vol. 43, No. 52:11082 – 11093). The overall range of *Drymarchon corais* extends from the southeastern United States coastal plain to northern Argentina. Only the subspecies eastern indigo (*Drymarchon corais couperi*) and Texas indigo (*Drymarchon corais erebennus*) occur within the United States.

1 The eastern indigo snake is the largest nonvenomous snake in North America and can grow up to
2 125 inches in length. The snake is a meat-eater (carnivorous) and will eat any animal up to about
3 the size of a squirrel. The snake frequents flatwoods, hammocks, stream bottoms, canebrakes,
4 riparian thickets, and high ground with deep, well drained to excessively drained, sandy soils.

5
6 Habitat preferences vary seasonally. Pine sandhill winter dens are used from December to April,
7 summer territories are selected from May to July, and from August through November indigo
8 snakes are frequently located in shady creek bottoms. These seasonal changes in habitat
9 encourage the maintenance of travel corridors that link these different habitat types (Hallam
10 et al., 1998).

11
12 The federally threatened eastern indigo snake is strongly associated with gopher tortoise
13 burrows. In Georgia, 92 percent of the indigo snakes identified during the study were located in
14 gopher tortoise burrows (Diemer and Speake, 1983). They use abandoned burrows in winter and
15 spring for egg laying, shedding, and protection from dehydration and temperature extremes.
16 Indigo snakes are even known to use tortoise burrows with collapsed entrances by creating a
17 small entrance. They also use stump holes, armadillo and gopher holes, and other wildlife
18 ground cavities.

19
20 The primary reason for its listing as federally threatened is population declines resulting from
21 habitat loss and fragmentation (Moler, 1987). Movement along travel corridors between
22 seasonal habitats also exposes the snake to danger from increased contact with humans. From
23 1978 to 1999, Jackson Guard reported the sighting of 18 indigo snakes throughout the Eglin
24 Mainland Reservation, based on Florida Natural Areas Inventory (FNAI) element occurrences
25 and incidental sightings (U.S. Air Force, 2000). Many of these snakes were seen while crossing
26 roads or after being killed by vehicles.

27
28 AAC/EMSN primarily conducts passive management for the indigo snake by maintaining
29 suitable habitat conditions. This includes the frequent use of fire over large portions of Eglin's
30 sandhills. The closure of forest roads and the use of perimeter access control also benefit indigo
31 snakes by reducing the frequency of accidental motor vehicle and indigo snake contacts.
32 Additionally, the management and recovery of the eastern indigo snake is closely linked to the
33 gopher tortoise. Management activities that benefit gopher tortoises benefit the indigo snake as
34 well.

35 36 **Gopher Tortoise (*Gopherus polyphemus*)**

37
38 The gopher tortoise is a Species of Special Concern in Florida. The gopher tortoise is found
39 primarily within the longleaf pine habitat of the Sandhills (U.S. Air Force, 1995). They also
40 seem to have a strong affinity for open, dry, uplands of many test areas. Gopher tortoises
41 construct burrows that are frequently located in areas with low-growing plants, and sandy, well-
42 drained soils in open, sunny areas with bare patches of ground. In the sandy soils of Eglin, the
43 self-excavated gopher tortoise burrows are estimated to be between 14 to 20 feet long and 6 to 18
44 feet below the surface. The burrows remain at fairly constant temperature and humidity
45 throughout the year, acting as a refuge from cold, heat, and dryness. They also act as a refuge
46 from periodic fires that occur in this dry habitat. One tortoise may maintain two to three burrows
47 within its home range.

The tortoise primarily eats grasses, leaves, fruits, seeds, and insects. The foods most frequently found in their diets are grasses (Poaceae spp.) and legume fruits (Fabaceae spp.). Female tortoises lay 3 to 15-eggs in the sand in front of their burrows during late April and May. These eggs incubate for up to 100 days. Predators such as raccoons, coyotes, and snakes often destroy more than 80 percent of gopher tortoise nests, resulting in a very low hatching success rate (Pucket and Franz, 1991).

The gopher tortoise is considered a keystone species. A keystone species is a species whose presence is ecologically significant to the survival of other species within its environment. Over 300 animals utilize the tortoise burrows; the tortoises disperse seeds while foraging; and their burrowing behavior turns over nutrients in the soil. Many associate species use or are dependent on tortoise burrows for seasonal or year-round dens, daytime retreats, nesting sites, food sources, and/or escape cover (Wilson et al., 1997). On Eglin, dusky gopher frogs and eastern indigo snakes use this critical habitat for cover.

Many inactive burrows are found on Eglin; the number of active burrows is considerably less. The rising number of inactive burrows has led to concerns about a population decline of the species due to poaching and loss of fire-dependent habitat (U.S. Air Force, 1995). Test area vegetation maintenance promotes the growth of preferred grass and forb food sources and high sunlight penetration, which is needed to attain minimum thermal requirements for daily activities (Mushinsky and McCoy, 1994). Thousands of acres of gopher tortoise habitat have been restored on Eglin AFB through prescribed burning.

Alligator Snapping Turtle (*Macrolemys temmincki*)

Alligator snapping turtles inhabit deep rivers as well as lakes and swamps near deep running water, but are occasionally sighted in brackish water within the Flatwoods and swamps and marshes of the Wetland/Riparian ecological associations.

Florida Pine Snake (*Pituophis melanoleucus*)

The Florida pine snake is typically found in Sandhill sandy soil areas occurring primarily in longleaf pine/turkey oak forests. Home ranges have been reported to vary from 3 to 68 acres. The snakes primarily feed on small mammals, birds and their eggs, lizards, other snakes and their eggs, and insects. The snake burrows to a depth of 9 to 12 inches in exposed loosely packed sandy soils for nesting, winter hibernation, and escape. Nest clearings average 166 feet long and 260 feet wide on slopes of less than 14 degrees. As with the eastern indigo snake, the pine snake is known to use active and inactive gopher tortoise burrows.

Birds

Osprey (*Pandion Haliaetus*)

The osprey, listed as a state species of special concern, is a large bird, similar in appearance to the bald eagle, with a dark brown back and a white underside and head. A dark brown streak extends through the eye and expands toward the head, and small streaks are exhibited on the top of its head and across the breast. Females are slightly larger than the male species. The osprey

utilizes areas near large water bodies that are fairly open for hunting, with nesting trees typically located in large living or dead trees and man-made structures.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle (*Haliaeetus leucocephalus*) was initially considered to have two distinct subspecies when the southern bald eagle was listed as an endangered species on March 11, 1967. The entire species was listed as endangered in 43 of the conterminous 48 states and threatened in the remaining five states (Michigan, Minnesota, Oregon, Washington, and Wisconsin) on February 14, 1978. The bald eagle is listed as threatened in the state of Florida. Declines in bald eagle populations began after WWII and have been attributed to the widespread use of the pesticide DDT from the post-WWII era to the early 1970s. This pesticide inhibited the nesting females' ability to metabolize calcium necessary for eggshell development, resulting in widespread nest failures for several decades. The bald eagle has two incidences of occurrence on the ELTTR; one nest at Cape San Blas and one nest on the Eglin Mainland Reservation.

Bald eagles have made an impressive comeback since the banning of DDT in the early 1970's, and on August 11, 1995, the bald eagle was officially downlisted from endangered to threatened in the lower 48 states. This comeback is particularly noticeable in northwest Florida where eagle nests have increased from approximately 500 to 600 nests in the mid-1980s to over 1,000 nests in the 1998-1999 nesting season (Florida Game and Fresh Water Fish Commission [now Florida Fish and Wildlife Conservation Commission], 1998).

In 1963, the National Audubon Society surveyed the lower 48 states and located only 417 active bald eagle nests. By 1994, 4,452 occupied territories were identified, an increase of 462 percent. An occupied territory is an area occupied by a pair of adult bald eagles. In the Southeastern Recovery Region (Texas, Louisiana, Mississippi, Alabama, Florida, Arkansas, Tennessee, Kentucky, Georgia, South Carolina, and North Carolina), 1,243 occupied territories were identified in 1996 with Florida having 879 of those territories (Millar, 1996). The Florida panhandle had 59 active nests in the 1997-98 nesting season (FWC, 1998).

Bald eagles nest when they reach four years of age. They are territorial and exhibit a strong affinity for a nest site once a nest has been established. It is common for a breeding pair to rebuild damaged or lost nests in the same tree or in an adjacent tree. The nesting period in the southeast United States extends from 1 October to 15 May with most nests being completed by the end of November. Individual pairs return to the same territory year after year and territories are often inherited by subsequent generations. Eagles typically lay between one and three eggs with an incubation period of 34-36 days. In northwest Florida, most successful nests are laid by mid-February. A nesting pair typically produces one to three fledglings, but usually only one fledgling will survive. The quality and amount of forage resources heavily influence fledgling survival. The fledging period has been documented to last from 70 to 98 days. Eagles forage on fish and on carrion.

Southeastern American Kestrel (*Falco sparverius paulus*)

The southeastern American kestrel is a small raptor that preys upon insects during the summer and also feeds on small rodents, birds, and reptiles that are common in open grasslands. More than 30 species of birds and about 30 species of mammals are listed as prey (Mueller, 1987). Generally it lays its eggs in early to mid-April (Bent, 1962). The birds search for prey from high perches along the forest edge or hover over open areas with short, sparse vegetation (DeGraff et al., 1991). There have been numerous sightings of the kestrel throughout the Eglin Reservation.

The kestrels occupy nearly all Grassland/Shrubland, Sandhills, and other forested community types. Habitat requirements include adequate prey, perch sites, and nesting sites. They mostly inhabit open forests and clearing edges with snags. The thick understory and midstory in Sandhills communities that are cut or are not burned may have an adverse effect on kestrel populations. Prescribed burning can be beneficial since it enhances habitat and increases the prey base (Hoffman and Collopy, 1988).

Nests are normally located along the forest edge and may be used for several years. The kestrels prefer to nest in snags and tight-fitting live tree cavities created by other birds (DeGraff et al., 1991). The birds most frequently locate their nests in abandoned red-cockaded woodpecker and other woodpecker holes in longleaf pine 12 to 35 feet above the ground. Natural cavities and snags in turkey oaks and live oaks may also be used as nesting sites (Hoffman and Collopy, 1987). The kestrels are quite tolerant of human activity around their nests. They are frequently flushed or caught at the nest without desertion.

Mammals**Florida Black Bear (*Ursus americanus floridanus*)**

The Florida black bear is listed as threatened by the State of Florida. It has been sighted throughout Eglin AFB. The population on Eglin AFB is Florida's fifth largest population of the subspecies. The bears are known to utilize forested flatwoods, swamp, and riparian areas for habitat. The exact locations of the bears are considered sensitive information because of the threat of poaching. Population numbers have been affected by fatal traffic collisions and destruction of habitat by encroaching development.

Plants**Southern Three-Awned Grass (*Aristida simpliciflora*)**

The Southern three-awned grass is an endangered plant in the state of Florida. It is found in open canopy longleaf pine-wiregrass habitats. Frequent fire is important to maintaining this species.

Pineland (Hairy) Wild Indigo (*Baptisia calycosa var villosa*)

The Pineland wild indigo is an herbaceous pea plant that can be found in the Sandhills and Sand Pine ecological associations in areas with an open canopy and sandy soils. The range of this species is restricted to Santa Rosa, Okaloosa, and Walton counties.

Curtiss' Sandgrass (*Calamovilfa curtissii*)

Curtiss' sandgrass, listed by the state of Florida as threatened, is found in wet prairies, wet flatwoods, and the edges of dome swamps within the Flatwoods ecological association. Frequent fires that control shrub encroachment serve to maintain this species.

Baltzell's Sedge (*Carex baltzellii*)

Baltzell's sedge, a state threatened species, is a grass-like sedge that occurs in the Sandhills ecological association in upland and mixed hardwood forest plant communities in shaded undisturbed slopes of steephead ravines.

Florida Anise (*Illicium floridanum*)

The steephead baygall or the Florida anise baygall is generally restricted to the bottom of steepheads at the origin or along the stream margins.

Mountain Laurel (*Kalmia latifolia*)

Mountain laurel is a state-listed threatened species and inhabits the Sandhills ecological association. It is found in underbrush of slope forests.

Bog Buttons (*Lachnocaulon dignum*)

Bog buttons is a small species that inhabits wet areas like seepage slopes, bogs, edges of baygalls, and drainages.

Panhandle Lily (*Lilium iridollae*)

The panhandle lily, a state-listed endangered species, inhabits streamside baygalls organic soil. Factors influencing its status include drainage and field collecting.

Ashe's Magnolia (*Magnolia ashei*)

Ashe's magnolia, a state endangered species, is a large flowering tree found in steephead ravines of the Sandhills ecological association.

Pyramid Magnolia (*Magnolia pyramidata*)

Pyramid magnolia, a state endangered species, is found on Eglin in the Sandhills region. Underbrush of slope forest provides resources needed for this plant to thrive.

Naked-Stemmed Panic Grass (*Panicum nudicaule*)

Naked-stemmed panic grass is found in fire-maintained wet, sticky, organic soil associated with seepage slopes and bogs.

Orange Azalea (*Rhodoendron austrinum*)

Orange azaleas, listed by the state as endangered, are small flowering shrubs found in the slope forest communities of the Sandhills ecological association.

Sweet (Red-Flowered) Pitcherplant (*Sarracenia rubra*)

The red-flowered pitcher plant, also known as the sweet pitcher plant, is listed as endangered by the state of Florida. This species feeds on insects and is found in shrub bogs, wet prairies, wet flatwoods, and baygall communities throughout Eglin.

Silky Camellia (*Stewartia malacodendron*)

The Sandhills ecological association is home to silky camellia, a Florida endangered species. It is found along steephead ravines and in slope forests on Eglin AFB.

Pineland Hoary Pea (*Tephrosia mohrii*)

The Pineland Hoary Pea, an herbaceous plant, is a threatened species in the state of Florida. This species is found within the upland pine forest community within the Sandhills ecological association. The range of this species is restricted to Santa Rosa, Okaloosa, and Walton counties.

Karst Pond Yellow-Eyed Grass (*Xyris longisepala*)

The karst pond yellow-eyed grass lives in Sandhill areas with upland lakes and in depression marshes.

SENSITIVE HABITAT DESCRIPTIONS**FNAI Tier Areas**

Within the natural communities mentioned previously, land area has been categorized using a four-level, tiered classification system (FNAI, 1997). This classification is based on the status of the existing vegetative community relative to its perceived natural state, potential for restoration, and the level of management intensity required to achieve restoration. The current status of the vegetative community is a direct result of historic disruptive events that have altered its structure,

composition, and function. These events include over-consumption of a single component or species such as occurred with the longleaf naval stores and logging industries at the turn of the century; surface disturbance activities such as intensive site-preparation techniques; and exclusion of natural formative forces, such as fire.

Portions of vegetative communities, which are in or closely approximate their undisturbed state, are classified as **Tier I**. These areas have experienced relatively few disruptive events. Examples would be the Patterson Natural Area and other areas of old growth or relatively undisturbed vegetation. Management activities focus on the maintenance category, utilizing methods that mimic natural formative forces such as prescribed fire.

Portions of vegetative communities that still retain a good representation and distribution of associated species and that have been exposed to moderate amounts and intensities of disruptive events are classified as **Tier II**. These are areas where ecosystem function and viability can be restored through careful, responsible management. Management direction emphasizes integrating appropriate management activities to accomplish restoration and maintenance objectives. Restoration activities include practices that will accelerate change in the desired direction (i.e., use of herbicides, and/or mechanical methods of hardwood control, supplemental planting of longleaf seedlings, etc.).

Portions of vegetative communities that do not retain a good representation and distribution of associated species and that have been exposed to severe amounts and intensities of disruptive events are classified **Tier III**. These are areas where restoration of ecosystem function and viability might be possible, but would require significant and intensive management commitment over extended periods of time. Depending on land-use priorities, management direction may encourage a return to a more natural vegetative association over the long term and/or may include intensive use of traditional management techniques. Management activity guidelines are less restrictive than in Tier I and Tier II areas. Tier III areas include pine plantations, as well as areas with extensive sand pine and/or hardwood encroachment resulting in severely altered natural vegetative components.

ECOLOGICAL ASSOCIATION DESCRIPTIONS

Sandhills

This is the largest ecological association on Eglin, covering 324,498 acres of the reservation (this includes 23,906 acres of forested test ranges). The Sandhills vegetative community represents the majority of this association, and includes the Sand Pine ecosystem, which covers three percent of the reservation, and the Pine/Mixed Hardwood ecosystem, which covers approximately 10,000 acres of the reservation. The Sand Pine ecosystem is the result of the encroachment of sand pine into the sandhills, causing some areas to become a sand pine-dominated forest that varies from predominately natural to substantially modified. This association has the oldest natural sand pine on the Eglin reservation. Eglin's largest area of pine/mixed hardwoods occurs in the northeast portion of the reservation along the eastern slope of Alaqu Creek, from Alice Creek to Sweetwater Branch. Another area of this ecosystem occurs along Blout Creek, near its confluence with Alaqu Creek, north of the preceding site. The majority of the area is open to the public on a limited basis (seasonally or conditionally,

1 depending on mission safety footprints). A small portion is closed year-round to public
2 recreation due to mission safety.

3
4 The Sandhills association varies from predominantly natural to substantially modified. The
5 association is characterized by rolling sandhill ridges dissected by streams. Slopes break sharply
6 next to streams, but are gradual next to wet, depressional areas. Numerous steepheads are found
7 throughout the association. The underlying geology is variable. Most of the association is
8 between 20 and 295 feet above sea level.

9
10 The soils are excessively drained, strongly acidic, brownish-yellow soils, low in natural fertility
11 and organic content. Seventy-eight percent of this association is characterized by soil
12 associations that are formed in thick deposits of sand extending to depths of more than 80 inches.
13 Only 10 percent of the soil associations have loamy subsoils on gently sloping narrow ridges and
14 steep side slopes. These soils are dissected by gray, sandy, poorly drained soils on narrow
15 stream bottoms.

16
17 Much of this association has been affected by early naval stores, logging, and fire control
18 practices, which severely reduced the pine overstory and led to encroachment by sand pine and
19 various “scrub” oaks. Mechanically established longleaf, slash, and sand pine plantations are
20 found throughout this association.

21
22 Approximately 97 percent of the Sandhills ecological association is fire dependant. However,
23 only about 51 percent is actually fire maintained (U.S. Air Force, 2002). Historically, the use of
24 fire as a management tool was very limited and scrub oak began to take over longleaf sites,
25 shading out ground cover plants. This lack of fire also allowed sand pine to encroach into the
26 longleaf sandhills. According to the 1931 Choctawhatchee National Forest Plan, there were only
27 7,000 acres of sand pine within the forest. By 1949, there were over 17,000 acres of sand pine in
28 the forest. The 1949 Eglin Management Plan stated: “There are many areas now which have an
29 overstory of longleaf pine, but an understory of sand pine and which will be converted to the
30 Sand Pine type when the longleaf pine is cut.” Thirty years later, by 1979, there were over
31 60,000 acres of sand pine on the reservation. To more closely mimic a natural system, growing
32 season prescribed fire began in 1994 as part of the vegetative restoration process.

33
34 The Sandhills ecological association can contain up to ten or more upland plant communities.
35 These include the sandhills, scrub, xeric hammock, upland pine forest, upland hardwood and
36 upland mixed forests, bluff, and slope forest. Wetland areas such as seepage streams, alluvial
37 streams, depression marshes, and sandhill upland lake communities are also found within the
38 Sandhills ecological association. The sandhill upland lake and depression marsh communities
39 differ from the other communities found in the sandhills in that they are generally permanent and
40 ephemeral water bodies, respectively. Considered wetland areas, seepage streams, alluvial
41 streams, depression marshes, and sandhill upland lake communities are classified under the
42 Wetland and Riparian ecological association.

43
44 The **sandhills** plant community contains soils that are deep, sandy, and well drained, creating a
45 dry condition. This plant community at Eglin has sparse canopies of second growth longleaf
46 pine with scattered old growth individuals, and may be accompanied by a middle canopy layer of
47 turkey oak, sand live oak, and sand pine. The higher quality sandhills have a sparse midstory

usually maintained by fire. Low shrubs are an important sandhill plant group and include saw palmetto, persimmon, dwarf huckleberry, gopher apple, and various oaks. The herbaceous understory includes various grasses and herbs including wiregrass, bluestems, pinewoods dropseed, various aster and golden aster species, small-leaved milkpea, sensitive brier, and large fruited beakrush. Other conspicuous plants include wild buckwheat and catbrier (FNAI, 1990). Sensitive species (discussed in greater detail in Section 5.3) include southern three-awn grass, pineland wild indigo, toothed savory, and pineland hoary pea.

The **scrub** plant community is supported by deep, loose, sandy soils that drain rapidly and are somewhat protected by fire; this includes areas such as those near creek confluences, along the mainland coast, and on barrier islands. It is often characterized by a closed to open canopy of sand pine, containing dense thickets of sand live oak and other shrubs in the middle canopy. The ground cover is generally sparse and includes lichens and herbs. Open patches of bare sand are common. Catastrophic fires every 15 to 100 years prevent the scrub from succeeding to a xeric hammock. A rare plant found in mainland scrub on Eglin is the large-leaved jointweed. This community is also represented at Santa Rosa Island and at Cape San Blas (FNAI, 1990).

The **xeric hammock** plant community is found on deep, excessively drained sands derived from old dune systems in areas protected from wildfire such as along shorelines and creeks. Xeric hammock (oak dominant) is typified by a scrubby, dense, oak-dominated, low canopy forest with little understory other than palmetto and lichens. It can also be a multi-storied forest of tall trees with an open or closed canopy. Typical plants include live oak, sand live oak, laurel oak, southern magnolia, sparkleberry, hollys, and saw palmetto (FNAI, 1990). A second type of xeric hammock dominated by sand pines is described in the Sand Pine ecological association.

The **upland pine forest** plant community found in the northeastern portion of Eglin (FNAI, 1990) is often confused with the sandhill community. The primary differences between them reside in their soil characteristics and their component plant and animal species. Upland pine forest soils contain sand mixed with clay, which generally holds soil moisture. Pristine examples of the upland pine forest community contain a longleaf pine dominant component with a wiregrass and forb understory. Mesic species, such as southern red oak, flowering dogwood, and blueberry, may also be found within this community (FNAI, 1990). Rare plants found in the upland pine forest include hairy wild indigo and pineland hoary-pea. Without frequent fires, upland pine forest will succeed to a plant community that contains a greater hardwood component, referred to as pine/mixed hardwood in the INRMP.

Upland hardwood and **upland mixed forests** are well developed, closed-canopy forests that typically contain a mix of deciduous and evergreen trees and shrubs. On Eglin, the upland hardwood forest occurs on xeric soils with little understory. Typically, it occurs in narrow corridors in sandy soil along the upper slopes of seepage streams downstream from a steephead, forming a transition zone between sandhills and streamside baygall. Rare plant species present include Florida anise, Baltzell's sedge, heartleaf, mountain laurel, Ashe's magnolia, pyramid magnolia, orange azalea, Alabama spiny-pod, Carolina lily, and silky camellia (FNAI, 1990). Its distinctive species is the laurel oak.

Bluffs are exposed sparsely vegetated, unstable slopes along rivers, streams, or bays where wind and water erosion is prevalent. Weedy plant species such as dog fennel, beautyberry, ragweed,

golden aster, and panic grasses are often found on bluffs. If the soil surface becomes stable, a slope forest may develop (FNAI, 1990).

The **slope forest** community is found on steep slopes, bluffs, and ravines that generally have sand, sandy-clay, or clayey sand soils with a high organic content. The slope forest community is characterized as a well developed, closed-canopy, upland hardwood forest (FNAI, 1990). Common dominant species include beech, southern magnolia, spruce pine, white oak, mockernut hickory, and needle palm. The understory can include silky camellia, strawberry bush, and saw greenbrier. Slope forest and surrounding sandhill communities can create a pine/mixed hardwoods gradation, similar to the condition created by fire exclusion in the upland pine forest community.

In addition to the seven plant communities described above, areas of flatwoods and wetlands also interrupt the Sandhill vegetation.

Present Condition

Approximately 16 percent of the Sandhill community has been substantially modified by heavy site impact reforestation techniques and the planting of slash and sand pine species. Fifty-seven thousand acres, or 16 percent of the community, has been altered to create open test ranges and administrative/residential areas. Almost half of the remaining 245,000 acres of the community remains in a severely cutover condition where scrub oak has become the dominant species.

During the last 10 years, 9,300 acres of naturally seeded longleaf pine have been released from hardwood competition with the herbicide “Velpar” with varying results due primarily to variations in application rates and techniques. In many areas that have not been treated with herbicide and have not been exposed to frequent recurring fire, scrub oaks and encroaching sand pine are now of sufficient size and density to affect midstory crown closure and shade out ground cover, including natural longleaf regeneration. It is estimated that less than one percent of the Sandhill community is in Tier I, approximately 36 percent is in Tier II, and the remaining 63 percent is in Tiers III and IV (U.S. Air Force, 2002).

Flatwoods

All three flatwoods communities, the Mesic, Wet, and Scrubby Flatwoods are found on the Eglin reservation. Approximately 17,297 acres of the Eglin Reservation fall within this ecological association (U.S. Air Force, 2002).

The **mesic flatwoods** community is the most prevalent community of the Flatwoods ecological association and is found on relatively flat, moderately to poorly drained, acidic, sandy soils underlain by an organic or clay hardpan. This community is dominated by open-canopied longleaf pine and a dense ground cover including runner oak, saw palmetto, wiregrass, bitter gallberry, St. John’s wort, and dwarf wax myrtle. This community is also represented at Cape San Blas (FNAI, 1992). Sensitive plants in this community include West’s flax, Curtiss’ sandgrass, and southern red lily.

1 **Wet flatwoods** communities are relatively open canopy forests of scattered pines with an
2 understory of dense hydrophytic herbs and shrubs (FNAI, 1994). They occur on poorly drained
3 terrain, where soils are similar to those found underlying mesic flatwoods. During the rainy
4 season, water stands for one month or longer on the surface of wet flatwoods communities.
5 Species found here typically include slash pine and sweet bay, along with the gallberry, titi,
6 dwarf wax myrtle, and pitcherplants. In the eastern and southwest portions of Eglin, this
7 community may also include pond pine. Relatively frequent fires, every 3 to 10 years, prevent
8 wet flatwood succession to dense baygall or close-canopy, hardwood-dominated forests that
9 shade out the ground cover. Rare plants found in wet flatwoods include southern milkweed,
10 white-top pitcherplant, sweet pitcherplant, Chapman's butterwort, and Curtiss' sandgrass.

11
12 The **scrubby flatwoods** plant community is found on slightly elevated sandbars and dunes that
13 are underlain by rapidly drained sandy soil. This community is found mainly in the southwestern
14 portion of the base. It has an open-canopied overstory of longleaf pine, with a middle canopy of
15 scrub oak, saw palmetto, and sparse ground cover. The scrubby flatwoods community represents
16 a combination of species found in the scrub community (see Section 2.1) of the Sandhills
17 ecological association and the mesic flatwoods community, described below.

18
19 While this ecological association is 100 percent fire dependant, Eglin currently maintains
20 approximately 70 percent of the habitat through prescribed fire. Historically, the use of fire as a
21 management tool was limited within these communities. Fire has been more prevalent in the
22 Scrubby and Mesic Flatwoods than in the Wet Flatwoods. Prescribed fire has been used more
23 often within these communities since the mid-1970s, but large portions still have had little or no
24 fire for many years. The lack of frequent fire has caused some of the Wet Flatwoods to succeed
25 to a hardwood-dominated forest with a closed canopy that has eliminated ground cover. This
26 lack of fire has also impacted the Mesic Flatwoods due to the encroachment of titi, although a
27 large majority of this community has received some fire in the recent past. Most of the longleaf
28 and slash reproduction in the flatwoods probably occurred before the U.S. Forest Service began
29 its fire control programs. A large portion of the flatwoods on the Yellow and East Rivers
30 continued to be burned until they were purchased by the U.S. Forest Service in the mid-1930s.

31 *Present Condition*

32
33
34 All three of these communities are mainly composed of younger, second growth trees. Relict
35 longleaf and slash pine and small stands of old-growth longleaf or slash can be found scattered
36 throughout the communities. The plants within these communities are adapted to fire and
37 several species depend on fire for their continued existence, although fire is severely lacking
38 within these communities and has caused parts of the community to succeed to a hardwood
39 forest association. The effects of recent prescribed fire can be seen in parts of this community.
40 Due to early cutting practices, lack of fire and spotty-to-heavy natural regeneration over a period
41 of years, the communities vary from an open, park-like appearance, to a very dense, almost
42 impenetrable, looking forest. Longleaf is the dominant pine on almost 90 percent of the
43 communities. The communities tend to look one size due to the relatively young and even aged
44 stand structure resulting from the overcutting and lack of fire. It is estimated that less than one
45 percent of this association is Tier I, approximately 70 percent is Tier II, and the remaining 25-30
46 percent is Tiers III and IV.

Wetlands

Wetlands and Riparian ecological associations on Eglin can be divided into the following categories: 1) Wetlands which are dominated by plants adapted to anaerobic substrate conditions imposed by saturation or inundation for more than 10 percent of the growing season, 2) lacustrine wetlands which occur in nonflowing wetlands of natural depressions, 3) riverine communities which are natural, flowing waters from their source to the downstream limits of tidal influence, and are bounded by channel banks, and 4) estuarine communities found along bays and bayous and consist of brackish waters. The above categories are further broken down into natural community types. Although acreage for each type has not been identified, approximately 60,809 acres of wetlands exists on Eglin, with approximately 1,158 miles of streams/riparian areas.

Baygalls are densely forested, peat-filled seepage depressions found along seepage streams, in wet and mesic flatwoods, in steepheads, at the base of seepage slope communities, and along edges of floodplain forest and bottomland forest. The tall, closed canopy is generally dominated by sweetbay, red bay, and titi. The understory can consist of shrubs and ferns. A sphagnum moss mat may be found interlacing with the exposed tree roots. Other typical plants include various hollies, wax myrtle, fetterbush, bamboo vine, red chokeberry, cypress, and lizard's tail. Peat fires could disrupt baygall communities (FNAI, 1990). Rare plants found in Eglin's baygalls include bog spicebush, Florida anise, sweet pitcherplant, white-top pitcherplant, panhandle lily, spoonflower, and spoon-leaved sundew (FNAI, 1994).

The baygall community type can be divided into three distinct plant associations limited by specific hydrologic, soil, and topographic characteristics.

- One is associated with seepage streams in sandhills and contains Atlantic white cedar (or "juniper"), sweet bay, and buckwheat tree groupings.
- Another occurs along and within the streambed of steepheads and some seepage streams well shaded by upland hardwood or mixed upland forest on the stream slopes. This cool, extremely mesic condition favors plants associated with Florida anise.
- A third baygall association covers large areas in the East Bay Swamp and may have resulted from logging and fire suppression activities. This plant group includes mainly the buckwheat tree, and occasionally slash pine, titi, and red bay (FNAI, 1994).

Seepage slopes or pitcherplant bogs are grass and sedge dominated wetlands found at the base of gradual slopes where underlying water is forced to the surface by an impermeable substrate. Soils are generally acidic loamy sands, and the ground is usually saturated but rarely inundated. The community includes wiregrass, beak-rushes, nutrushes, sunbonnets, blazing star, and black-eyed Susan, as well as a variety of insectivorous (insect-eating) plants including pitcherplants. Seepage slopes burn about every five years, limiting tree and shrub invasion of the successional baygall. Rare plants include white-top pitcherplant, sweet pitcherplant, naked-stemmed panic grass, Harper's yellow-eyed grass, Drummond's yellow-eyed grass, Chapman's butterwort, yellow fringeless orchid, pine lily, panhandle lily, bog-button, pine-woods bluestem, and snakeroot aster.

The **dry prairie** is a nearly treeless plain with a dense ground cover of wiregrass, Indian grass, goldenrod, saw palmetto, broomsedge, dwarf wax myrtle, and fetterbush. It occurs on relatively flat, moderately to poorly drained sandy soils overlying a hardpan. During heavy rains, prairies become flooded for short periods even though the water table remains several inches to several feet below the surface. The frequency of fires (every 1 to 4 years) prevents the pine invasion characteristic of mesic flatwoods (FNAI, 1990).

Flatwood lakes and **prairie lakes** are shallow, open-water depressions acting as groundwater recharge areas. They are inundated mostly by runoff from uplands in the immediate area. Soils in these depressions generally consist of sands with peat and occasionally a clay lens. These lakes are typically surrounded by either a sparse, wet prairie-like zone or a dense ring of saw palmetto and other shrubs. Typical plants include spikerush, yellow-eyed grasses, St. John's wort, pickerelweed, arrowhead, bulrushes, and nut sedge (FNAI, 1990).

The **floodplain forests** are found on drier soils on ridges, levees, and terraces that are usually flooded during a portion of the growing season. The dominant trees are generally overcup oak, water hickory, diamond-leaf oak, and swamp chestnut oak. The understory may be open or dense, and includes bluestem palmetto, willow oak, green ash, plume grass, and silverbells (FNAI, 1990).

Floodplain swamps are flooded most of the year and occur on flooded soils along streams and rivers. Dominant trees are usually buttressed trees, such as cypress and tupelo. The understory is generally sparse but can include titi, dahoon holly, lizard's tail, and numerous ferns (FNAI, 1990).

Bottomland forests are found on low-lying flatlands that border streams with elevated banks; the soils here consist of clay and organic material, and are rarely inundated. This closed-canopy forest contains tall, straight trees with a shrubby or herbaceous ground cover. The closed canopy traps humidity and prevents burning. These areas are similar in appearance to floodplain forests and hydric hammocks except that bottomland forests usually are not wet during periods of typical high water. Typical dominant plants include laurel oak and southern magnolia (FNAI, 1990).

Wet prairies are found on sandy soils, often containing a substantial clay component. This community is typified by a treeless plain of grasses and herbs that is seasonally saturated for 50-100 days each year. It burns every 2-4 years, thus preventing a wax myrtle invasion. These prairies usually dry out during the year, often suffering off-road vehicle impacts from which recovery is poor and slow. Typical plant species include wiregrass, maidencane, spike-rush, beak-rush, black-eyed Susan, meadowbeauty, yellow-eyed grass, pitcherplants, and St. John's wort (FNAI, 1990). Rare plants found in wet prairies include pine-woods bluestem, Curtiss' sandgrass, pond rush, spoon-leaved sundew, southern red lily, West's flax, Chapman's butterwort, white-top pitcherplant, sweet pitcherplant, and Drummond's yellow-eyed grass (FNAI, 1994).

Hydric hammock occurs on low, flat, wet sites where limestone may be near the surface. Soils are sands intermixed with considerable organic material, and may be inundated for short times following heavy rains. The community is a well-developed hardwood forest with an understory

of palms and ferns; it is only found in the Alaqua Point Hammock Natural Area (discussed in Section 6.3.11) on Eglin's Choctawhatchee Bay shoreline. Hydric hammock often occurs intermittently and is associated with springs or seepages, or as extensive forests covering lowlands just inland of coastal communities. The balance of moisture feeding and maintaining this community is delicate, and drier or wetter conditions may cause a gradual plant community succession. Typical plants include laurel oak, red cedar, red maple, sweetbay, water oak, southern magnolia, wax myrtle, saw palmetto, yellow jasmine, and royal fern (FNAI, 1990).

Blackwater streams are steep-banked streams that characteristically have tea-colored waters laden with tannins, particulates, and dissolved organic matter and iron from swamps and marshes that feed into the stream. They have sandy bottoms overlain by organics, and they generally lack the continuous extensive floodplains and natural levees of alluvial streams. Emergent and floating aquatic vegetation may occur along shallow and slow sections of the stream where the banks are less steep. Typical plants include golden club, smartweed, sedges, and grasses (FNAI, 1990).

A **marsh lake** is similar to a depression marsh except that the depth and slope of the depression is such that an open water zone is present. The open water may or may not have floating plants. In a marsh lake, the open water area is small in comparison to the surrounding marsh, while a large open water area characterizes a flatwoods lake or a prairie lake, depending on the surrounding community (FNAI, 1990).

Abundant throughout Florida, **sloughs** are broad channels inundated at least 250 days per year with flowing water that are the deepest drainage ways within strand swamps and swale systems. The variable vegetation structure generally contains pond apple, giant cutgrass, duckweed, pickerelweed, and arrowheads. The soils are peat unless they have been destroyed by catastrophic fires during a drought. Sloughs are vulnerable to hydrologic disturbance, peat mining, and clearcutting (FNAI, 1990).

Dome swamp plant communities are typically found in wet flatwoods on peat soils underlain by acidic sands. This community is characterized as a shallow, forested, usually circular, sinkhole depression that presents a domed profile because smaller trees grow in the shallow waters at the outer edge, while bigger trees grow in the deeper water in the center. Every three to five years, fires burn the outer edge of the swamp, which also maintains the domed profile. The high-moisture, peaty center is burned only every 100-150 years. Typical dominant plant species include pond cypress, blackgum, slash pine, and St. John's wort, with an understory of ferns, sphagnum moss, floating heart, and fetterbush (FNAI, 1990 and 1994). Rare plants found in dome swamps include Chapman's butterwort, Curtiss' sandgrass, and savanna aster (FNAI, 1994).

Strand swamps are shallow, forested, usually elongated depressions or channels inundated 200-300 days per year with peat and sand soils dominated by bald cypress. Small, young trees at the outer edge and large, old ones in the interior give the community a rounded profile. Typical plants include red maple, laurel oak, sweet bay, wax myrtle, buttonbush, leather fern, floating heart, and dotted smartweed. Fire occurs on a cycle of 30 to 200 years keeping hardwood invasion and peat accumulation from converting the strand swamp to bottomland forest. Catastrophic fires could turn a strand swamp into a slough (FNAI, 1990).

1
2 A **basin marsh** is characterized as an herbaceous or shrubby wetland situated in a relatively
3 large and irregularly shaped closed basin that is inundated about 200 days per year where a lake
4 has slowly filled in with sediments and peat. Typical plants include common reed, panicum,
5 cutgrass, pennywort, arrowhead, saltbush, elderberry, spike-rush, and dog fennel. A basin marsh
6 appears similar to a depression marsh and will succeed to a bog if muck fires do not occur. The
7 marsh burns every 1 to 10 years, restricting shrub and hardwood invasion. Open water within a
8 basin marsh would be a marsh lake. Basin marshes are susceptible to changes in hydrology and
9 pollution from agriculture (FNAI, 1990).

10
11 **Depression marsh** communities are shallow, generally ephemeral, rounded depressions (FNAI,
12 1990). These marshes can be found in sandhills, flatwoods, and on the barrier islands. Peaty soil
13 accumulates in the deepest sections where water is most permanent. Their small size and
14 ephemeral hydroperiod distinguishes them from the larger and more permanent upland lakes in
15 the sandhills. Many high quality depression marshes occur at Eglin. Herbaceous vegetation is
16 often found in this plant community in concentric bands. Typical plants include St. John's wort
17 around the margins with spike-rush, yellow-eyed grass, shoe buttons, bog violet, and bladderwort
18 in the interior. Frequent fires are important in preventing the invasion of shrubs and trees, and
19 for the formation of peat (FNAI, 1990). Rare plants found in depression marshes on Eglin
20 include panhandle meadow beauty, piedmont joint grass, and karst pond xyris, with one
21 observation of the west Florida cowlily (normally associated with riparian habitats) (FNAI,
22 1994). Other rare plant species include panhandle meadow beauty (*Rhexia salicifolia*), karst
23 pond yellow-eyed grass (*Xyris longisepala*), and water sundew (*Drosera intermedia*).

24
25 **Bogs** are characterized as wetlands on deep peat substrate with moisture maintained by capillary
26 action and saturated or inundated soils. They are found around lakeshores and in dome swamps,
27 pond, and sinkholes. Sphagnum moss and dense evergreen forests, shrub thickets, or marshy
28 prairie are found on bogs and include plants such as titi, slash pine, wax myrtle, fetterbush, large
29 gallberry, sweet bay, tupelo, blueberry, arrowheads, and arum. Rare plants include pitcherplants,
30 bog buttons, and orchids (FNAI, 1990).

31
32 A **freshwater tidal swamp** occurs on river mouth floodplains just inland from salt marshes and
33 is influenced by daily tidal changes. Their inundated organic soils support trees that are well
34 developed inland but become increasingly stunted with proximity to the coast; this causes the
35 trees often to develop extensive mats of convoluted surface roots. These swamp forests often
36 contain cabbage palm, bald cypress, southern magnolia, water tupelo, titi, saltbush, asters, and
37 leather fern. They are sensitive to hydrological modifications, saltwater intrusions, and clearcut
38 logging (FNAI, 1990).

39
40 **Floodplain marshes** occur in Rocky Bayou and have a strong fresh water influence that inhibits
41 the development of a true salt marsh. Dominant emergent species include sawgrass, smooth
42 cordgrass, saltmeadow cordgrass, black needlerush, and giant reed. Widgeon-grass and tape
43 grass represent the submerged vegetation (FDNR, 1991).

44
45 **Salt marshes** are found along Eglin's Choctawhatchee Bay and East Bay coastlines and can also
46 be found at Cape San Blas. They are influenced by tidal changes and freshwater influxes from
47 adjacent streams. The health of the vegetation in salt marsh communities often indicates the

overall health of the system. Salt marsh communities are typified by non-woody, salt-tolerant plants occupying intertidal zones that are inundated at least occasionally with salt water (Montague and Wiegert, 1991). Salt marsh vegetation typically occurs in areas having low wave energy (Durako et al., 1985). The principal species of salt marsh plants in Florida are black needlerush and smooth cordgrass. A variety of other species found there include glasswort, saltwort, and salt grass (FNAI, 1990).

Sandhill upland lakes are represented on Eglin by a few, large, generally permanent, shallow lakes in upland communities. The water source is often derived from lateral ground water seepage. Vegetation is largely restricted to a narrow band along the shore, composed of grasses and herbs or a dense shrub thicket. Floating plants sometimes cover much of the surface of the water. Typical plants include panicums, rushes, waterlilies, arrowheads, yellow-eyed grass, meadowbeauty, and spike-rush (FNAI, 1990). Rare plant species include panhandle meadowbeauty (*Rhexia salicifolia*) and karst pond yellow-eyed grass (*Xyris longisepala*).

Alluvial streams are typically turbid streams whose temperature and other water quality parameters fluctuate with seasonal rainfall patterns. On Eglin, they are represented by Blount Creek, Alaquia Creek, Shoal River, and Yellow River. They originate in high uplands where clay is a substantial soil component. Rainfall becomes surface runoff, carrying sediments and organic debris to the alluvial streams. During flood stages, biological nutrients are washed into these streams and carried to the floodplains and estuaries below providing an important source of nutrient replenishment. Water lilies and other floating plants occasionally occur along quiet stretches, with pickerelweed and cattails fringing the banks. Trees, such as cottonwoods, occasionally grow along the banks and on the natural levees (FNAI, 1990). Rare plant species include Piedmont water milfoil (*Myriophyllum laxum*), West Florida cow lily (*Nuphar lutea ssp. ulvaceum*), Florida pondweed (*Potamogeton floridanus*), and Alabama beakrush (*Rhynchospora crinipes*).

Blackwater streams, such as the Blackwater River and Blackwater Creek, are characterized as perennial or intermittent seasonal water courses originating deep in sandy lowlands where extensive wetlands with organic soils function as reservoirs, collecting rainfall and discharging it slowly to the stream. The dark, tea-colored water typical of blackwater streams are laden with tannins, particulates, dissolved organic matter, and iron derived from drainage through swamps and marshes. Rare plant species include Piedmont water milfoil (*Myriophyllum laxum*), West Florida cow lily (*Nuphar lutea aap. ulvaceum*), and Florida pondweed (*Potamogeton floridanus*). **Seepage streams**, along with blackwater streams, are the most common stream type found on Eglin. Seepage streams are clear to lightly-colored, relatively short, shallow, and narrow water courses originating from shallow ground waters that have percolated through deep, sandy, upland soils. The water temperatures maintain around 70 degrees Fahrenheit. These streams often form the headwaters of many alluvial and blackwater streams by picking up large sediment loads or draining through extensive swamps where water clarity can be diminished. In areas sheltered by a dense overstory of broad-leaved hardwoods, filamentous green algae often grow within the stream. Mosses, ferns, and liverworts grow in clumps at the water's edge. In lower, broader areas that get more sunlight, narrow bands of spatterdocks, golden club, spike-rush, pondweed, and tapegrass may be found. These streams also support many rare plant species and the Okaloosa darter. Steephead streams are a type of seepage stream where the seepage area has created a slump in the hillside (FNAI, 1990). The majority of the streams located on Eglin are

classified as seepage streams. The seepage streams that drain into Rocky and Boggy Bayous are inhabited by the Okaloosa darter, a federally endangered fish. Rare plant species in seepage streams include water sundew (*Drosera intermedia*), white-topped pitcher plant (*Sarracenia leucophylla*), sweet pitcher plant (*Sarracenia rubra*), spoon flower (*Peltandra sagittifolia*), and panhandle lily (*Lilium iridollae*).

Spring run streams, also referred to as calcareous streams, springs, or creeks, originate in deep artesian springs. The only example of a spring-run stream on Eglin is Blue Spring Creek in Okaloosa County. Typical plant species include tap grass, arrowheads, southern naiads, pondweeds, and chara. Rare plant species include water sundew (*Drosera intermedia*), and white-topped pitcher plant (*Sarracenia leucophylla*).

Present Condition

Wetlands and riparian areas are, for the most part, in a stable condition. However, Eglin currently has 286 erosion sites on the reservation, largely the result of erosion from roads and clay and sand pits. It is estimated that Eglin experiences approximately 90,000 tons of soil loss into watersheds on an annual average basis. Information regarding erosion control methods implemented by EMSN can be found in the INRMP.

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